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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/990,049	11/21/2001	William Ford	282662US8X	1484
22850 7590 09/13/2007 OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER NAFF, DAVID M	
			ART UNIT 1657	PAPER NUMBER
			NOTIFICATION DATE 09/13/2007	DELIVERY MODE ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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jgardner@oblon.com

<p align="center"><b>Office Action Summary</b></p>	<b>Application No.</b> 09/990,049	<b>Applicant(s)</b> FORD ET AL.	
	<b>Examiner</b> David M. Naff	<b>Art Unit</b> 1657	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12/26/06, 2/12/07 & 6/18/07.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 25-43, 45 and 47 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 25-43, 45 and 47 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)<br>2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)<br>3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____. | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____.<br>5) <input type="checkbox"/> Notice of Informal Patent Application<br>6) <input type="checkbox"/> Other: _____. |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**DETAILED ACTION**

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/26/06 has been entered.

An amendment and supplemental amendment were respectively filed 12/26/06 and 2/12/07. In response to a Notice of Non-compliant amendment of 5/18/07, a supplemental amendment was filed 6/18/07 as responding to the office action of 1/23/09.

The amendment of 6/18/07 amended claims 25, 27, 30, 31, 33-41, 43, 35 and 47, and canceled claim 44.

Since the amendment of 6/18/07 omits claims 48-66 added by the supplemental amendment of 2/12/07 and states (page 8, line 4) that claims 25-43, 45 and 47 are active, it is presumed claims 48-66 are canceled. The response to this action should show the status of claims 48-66 as canceled.

Claims examined on the merits are 25-43, 45 and 47.

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C.

112:

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5 The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 25-43, 45 and 47 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not  
10 described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claim 25, support is not found in the specification for "at least one metal nanoparticle" (line 2), "at least one metal  
15 nanoparticle-nucleic acid composite" (line 13), and "at least one nanoparticle" (line 15). In claims 34-40, "at least one metal nanoparticle" is not supported in the specification. In claim 41, "more than one metal nanoparticle" is not supported in the specification. The specification does not recite "at least one metal  
20 nanoparticle". This recitation encompasses one metal nanoparticle. The specification fails to disclose that the invention can involve only one metal nanoparticle, and does not support the process can produce a composite containing only one metal nanoparticle. In regard to claim 41, the specification does not recite "more than one metal  
25 nanoparticle" as being contained by a nanowire. This recitation encompasses only a few metal nanoparticles such as two contained by the nanowire, and there is not support in the specification that the nanowire can contain only a few metal nanoparticles.

***Claim Rejections - 35 USC § 103***

Claims 25-31, 33-43, 45 and 47 are rejected under 35 U.S.C.

103(a) as being unpatentable over Pompe et al (AR) in view of Singh et al (5,560,960) and Richter et al (AQ) for reasons in the previous  
5 office action of 1/23/06, and for reasons herein.

The claims are drawn to a process of producing a metal nanoparticle-nucleic composite containing at least one metal nanoparticle by reacting a nucleic acid with a metal complex to produce a metal complex-nucleic acid conjugate by metalation of bases  
10 and/or binding through an interactive group, removing non-conjugated byproducts, and reacting the conjugate with a reducing agent to produce the metal nanoparticle-nucleic acid composite. The metal nanoparticle-nucleic acid composite is catalytically active towards electroless metallisation, and the metal nanoparticle is not  
15 visualized by atomic force microscopy. Also claimed is a metal nanoparticle-nucleic acid composite resulting from the process, a process of making a nanowire by treating the composite by electroless deposition of metal, a nanowire resulting from the process, and a network or electronic circuit containing the nanowire.

20 Pompe et al disclose (page 1090, left col, second full paragraph) that Pt(II) and Pd(II) complexes such as cis-diamminedichloroplatinum attach to DNA bases to form stable monofunctional and bifunctional adducts. Further disclosed (third full paragraph of the left col) is that the Pt-DNA bond is not broken during reduction, and that Pt(II)  
25 and Pd(II) complexes attached to DNA double chain can act as

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nucleation centers for the growth of metal clusters. Also disclosed is carrying out metallization of DNA by adding DNA to Pd salt solution followed by adding a reducing agent, and obtaining clusters on the DNA of 3 to 5 nm in diameter in a few seconds after adding the reducing agent (paragraph bridging the cols, page 1090).

Singh et al disclose (paragraph bridging cols 1 and 2) precipitating nanometer-sized metal particles from solution within vesicles made from polymerizable phospholipids. Polymerized phospholipids are formed and added to a electroless plating solution. Before the electroless plating solution is added, palladium or platinum is provided on the inside surface of vesicles to function as a catalyst (col 3, lines 44-64). To insure that metal particles form only on the inside surface, any metal on the exterior surface of the vesicle is removed such as by using a chelating agent and gel filtering, or by passing the vesicles through an ion exchange column. Singh et al further disclose (col 5, line 18) using cobalt, nickel or iron when producing metal nanoparticles by electroless plating.

Richter et al disclose (page 508 and 510) metallization of DNA similar to Pompe et al and disclose formation of clusters of 1-5 nm diameter on DNA (page 508, left col, third full paragraph).

It would have been obvious to attach cis-diamminedichloroplatinum to DNA as disclosed by Pompe et al, and then use a reducing agent to obtain DNA containing attached platinum metal catalysis for use in electroless deposition of metal on the DNA as suggested by Singh et al subjecting vesicles containing Pd or Pt to electroless metal

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deposition and as suggested by Pompe et al carrying out metallization of DNA by treating a DNA solution with a Pd salt solution, and then adding a reducing agent to form metal clusters on the DNA. Removing any non-attached metal complex from the DNA before electroless metallization would have been obvious to prevent the non-attached metal complex from forming metal particles as suggested by Singh et al removing metal from the exterior of vesicles to prevent metal particles from being formed on the vesicles exterior surface. The objective of Pompe et al is to obtain metal clusters on the DNA and not at other places, and to accomplish this one would obviously have to remove non-attached metal complex before electroless metallization. Removing any non-conjugated by-products would have been obvious simply to prevent any possible inference with subsequent reactions. It would have been apparent from Richter et al that metal clusters of 1-5 nm diameter can be obtained, and it would have been obvious to produce clusters not thicker than DNA since this is an objective of Pompe et al (page 1090, left col, first full paragraph). Such clusters will not be capable of being visualized by atomic force microscopy. Reacting DNA with cis-diamminedichloroplatinum as disclosed by Pompe et al followed by reducing as set forth above will inherently result in metallization of bases, and provide a metal nanoparticle active towards electroless metallization. When carrying out metallization of DNA as set forth above, it would have been obvious to form a nanowire since Pompe et al (page 1090, right col, lines 1-10) and Richter et al (paragraph bridging pages 508 and 509) obtain a nanowire. Using the

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nanowire in an electronic circuit would have been obvious since metal wires are conventionally used in such circuits. The metallization of Pompe et al and Richter et al is controlled since they disclose controlling the time of metallization to control the size of clusters.

5 The use of cobalt, nickel or iron when producing metal nanoparticles by electroless plating as disclosed by Singh et al would have suggested using a electroless plating solution as in claim 38.

#### ***Response to Arguments***

The amendments urge that claims 25 and 40 require that the at  
10 least one metal nanoparticle cannot be visualized by atomic force microscopy. However, as set forth above, Richter et al disclose metal clusters of 1-5 nm diameter can be obtained, and it would have been obvious to produce clusters not thicker than DNA since this is an objective of Pompe et al (page 1090, left col, first full paragraph).  
15 Such clusters will not be capable of being visualized by atomic force microscopy.

#### ***Claim Rejections - 35 USC § 103***

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 25-31, 33-43, 45 and 47  
20 above, and further in view of Newsman et al (5,670,680) for reasons in the previous office action, and for reasons herein.

The claim requires a gaseous reducing agent.

Singh et al disclose using hydrogenation (col 4, line 57) for reducing metal ions to produce metals in a process of producing metal  
25 nanoparticles by electroless plating.



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Newman et al disclose using hydrogen gas for hydrogenation in producing metal complexes.

It would have been obvious to use hydrogen gas as a reducing agent to reduce the metal of a conjugate of a metal complex and DNA disclosed by Pompe et al as suggested by Singh et al and Newman et al.

#### ***Response to Amendment***

The amendments urge that the references do not suggest the metal nanoparticle cannot be visualized by atomic force microscopy. However, as set forth above, the references suggest, a metal nanoparticle of a size that cannot be visualized by atomic force microscopy.

#### ***Double Patenting***

Claims 25-31, 33-43, 45 and 47 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-32 of U.S. Patent 6,884,587 (issued from application 10/210,812 previously applied) in view of Singh et al.

The claims of the patent require metallization of a nucleic acid to produce a metal nanoparticle-nucleic acid composite.

It would have been obvious in view of Singh et al for the type of reasons set forth above to remove non-conjugated metal complexes and/or non-conjugated by-products, if formed, before treatment with a reducing agent in the process of the copending application claims for metallization of DNA. The presence of extraneous metal complex or other by-products will obviously be a contaminant that can interfere with subsequent reactions.

***Response to Arguments***

The rejection has been applied non-provisionally to the issued patent claims as requested in the amendment.

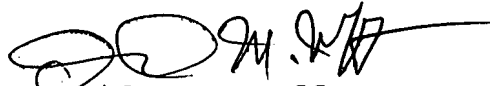
***Conclusion***

5       Any inquiry concerning this communication or earlier communications from the examiner should be directed to David M. Naff whose telephone number is 571-272-0920. The examiner can normally be reached on Monday-Friday 9:30-6:00.

10       If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jon Weber can be reached on 571-272-0925. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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David M. Naff  
Primary Examiner  
Art Unit 1657

DMN

15 9/3/07